Implementation of an Interactive, Multi-Language, App-Based Neurocognitive Evaluation Program into Routine Stereotactic Radiosurgery Practice

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Abstract

Objectives:

Neurocognitive decline among patients receiving stereotactic radiosurgery (SRS) is a significant negative predictor of functional status and clinical outcome. Conventional in-person neuropsychological tests are arduous to process, time-consuming, labor-intensive, costly, and require highly-trained specialists. The objective of this prospective study was to implement an alternative app-based solution that would allow management of multiple patients simultaneously, monitor patient assessments over time, collect patient data easily, and be suitable for cross-cultural use in multiple languages.

Methods:

Patients undergoing SRS from December 2021 to September 2022 enrolled onto a prospective clinical trial (NCT05504681) and were analyzed in this study. The interactive, app-based assessment consisted of 5 domains in 6 available languages (including English, Spanish, French, etc): learning and memory (Hopkins verbal learning test-revised [HVLT-R]), attention and processing speed (Digit symbols modalities test [SDMT]), verbal fluency (Controlled oral word association test [COWAT]) and executive function (Trail making test [TMT]). Patients underwent neurocognitive evaluation prior to treatment as well as with routine imaging and clinical follow-up, typically at 3-month intervals. To evaluate the functionality and usefulness of the application in terms of user experience, participants completed a patient feedback survey after 2+ assessments. Mean relative decline from baseline for each test was assessed.

Results:

Fifty SRS patients (41 brain metastases, 9 primary brain tumors) with median age of 69 years (range, 32-86 years) were enrolled; 30 patients (60%) were Hispanic, 14 (28%) were White/Caucasian, and 6 (12%) were African Americans. 41% of patients performed testing in Spanish. The median Karnofsky Performance Scale (KPS) score was 90%; 56% were female; 60% of participants had a high school or equivalent level of education. At 6 months, the mean relative decline was 15.9% for HVLT-R-immediate recall (IMM), 11.4% for COWAT, and 6.1% for HVLT-R-delayed recall (DR). However, we observed a mean relative improvement of 40.5% for SDMT, 30.2% for TMT B, 24.1% for TMT A, and 14% for HVLT-R-recognition (Rec). Among 32 (64%) patients who completed the patient feedback survey, the majority found the system and questions easy to understand (97%), easy to use (93.8%), and relevant to their care (71.9%). Most patients reported that app-based neurocognitive evaluation improved discussions with clinicians (75%), made them feel more in control of their own care (78.1%), and 84.4% reported that they would recommend the system to other patients with CNS malignancies.

Conclusion(s):

The first implementation of the interactive, multi-language, app-based neurocognitive evaluation program shows broad patient acceptance, a very favorable and positive patient experience, and a high level of compliance in following neurocognitive function in patients undergoing SRS. Based on these findings, our preliminary conclusion is that the clinical utility and value of implementing this app-based program into...
routine SRS practice is substantive, and therefore this has now been broadly incorporated in our practice.